ARMY COMMUNICATOR

Voice of the Signal Regiment

Big Data

Plus:
- *Signal History*
- *Training for Near Pear Threats*
- *Signal Spotlight*

FROM THE CIVIL WAR TO WINNING IN THE ERA OF GREAT POWER COMPETITION

U.S. ARMY SIGNAL CORPS
1860 - 2020
160 YEARS OF EXCELLENCE

Contents

On the Cover

Countless amounts of Data is stored in dedicated server locations (similar to the one pictured) and accessed via cloud networks. Courtesy photo.

Chief of Signal Regimental Team

Welcome back to the Communicator. Last month we discussed our priorities for this year. One of those priorities is Modernizing the Training Environment. This includes keeping our current MOS's up to date but also looking at areas that may need more attention. An aspect of the Signal realm that sometimes gets overlooked is Big Data.

The Army produces copious amounts of data that must be transported, stored, and secured but who is responsible for doing this? As we look to the future of Multi-Domain, Large Scale Combat Operations, big data will be a major factor which has lead the Army to update our data plan. This plan provides an all-inclusive methodology across people, processes, technology, and governance.

We, as the Signal Regiment, are looking into the 255 and FA26 occupational specialty fields to better inject the required roles and responsibilities for big data.

We want the Army's data to be visible, accessible, usable, transportable and interoperable. Improving how we handle data will allow for faster decision-making at every level. We continue to work with industry to improve our knowledge on big data, cloud management, machine learning, and artificial intelligence. It is our goal to emplace the best systems and processes so commanders have the access and resources required to complete their missions effectively and efficiently.

As always, we are interested in you and what you are doing for the Regiment every day. With the Communicator now being published monthly, we are always looking for additional content. If you'd like to contribute with either an article or photographs please do not hesitate to contact us.

Signal Strong!
Pro Patria Vigilans!

BG Christopher Eubank
Chief of Signal

CSM Richard Knott
Regimental CSM

CW5 Garth Hahn
Regimental CWO

Signal Soldier's sacrifice honored with memorial

Nicholas Spinelli
Office Chief of Signal

A Signal Soldier was posthumously honored recently, with a Memorialization Ceremony at the newly named Edgerton Barracks on Fort Gordon, Ga. The building was dedicated to Sgt. Marshall Edgerton, who was killed in action while serving in Iraq.

Sgt. Edgerton began his military career in May of 2000 and deployed in 2002 with HHC, 1st Battalion, 504th Parachute Infantry in support of Operation Enduring Freedom. Less than a year after returning home, he volunteered to deploy again, this time with the 82nd Signal Battalion, in support of Operation Iraqi Freedom.

"He felt this was his duty and was right in line with our Army Values," Brig. Gen. Christopher Eubank, Chief of Signal, said. "Not only did he demonstrate these attributes by volunteering for the deployment, it was because of him no one else lost their life that unfortunate day."

While on Force Protection Duty at Combat Outpost Champion Main in December of 2003, Edgerton entered an Iraqi vehicle to serve as an escort onto the installation. Realizing something was wrong, Edgerton was able to warn others not to allow the vehicle access before the driver detonated an Improvised Explosive Device. While Edgerton was killed in the explosion, his quick reaction and attention to detail potentially saved the lives of countless others. According to Eubank, who was also stationed in Iraq at the time, when word first came down of the attack, very few details were available.

"All we knew at the time was that a young Soldier had saved the lives of so many. That young Soldier was Marshall Edgerton," he said.

In honor of Edgerton's sacrifice, a memorial was established outside the barrack's building that now also shares his name.

"As Soldiers come through Edgerton Barracks they will read his story and see the impact they can have as a Signal Soldier," Eubank said. "Sgt. Edgerton demonstrates what we hope all our Soldiers become; selfless leaders."

This monument in front of Building 33806, shown here Dec. 11, honors the building's namesake: Sgt. Marshall Lane Edgerton.
Photo by Bill Bengtson

4

Looking at the Army Data Plan

Chief Information Officer, G6
Army News Service

The Army Data Plan, aligned to the Army Vision, sets forth guiding principles, goals and objectives, imperatives, and data management structures to transform how the Army manages, analyzes, and utilizes data to enable data-driven decisions across its enterprise, and with partners, through a resilient, secure hybrid cloud solution.

The Army Data Plan establishes the framework to utilize the Army's institutional data better to increase the speed of decision-making at all echelons. The data plan provides guidance on implementing common standards across the enterprise to facilitate interoperability between the joint, coalition, and mission partners.

The Army Data Plan applies to all Army data. It describes a global, standards-based environment where data and information are visible, accessible, understandable, trusted, interoperable, and secure throughout its lifecycle.

Currently, the Army has disparate, isolated data sources, which limits data sharing, hinders the speed of decision making at echelon and prohibits the use of current and emerging cloud capabilities, including evolving artificial intelligence (AI) and machine learning (ML) services and tools.

To evolve the Army into a more information-based organization, data will be unleashed for utilization across mission areas. This effort will help gain better insight, maintain technical overmatch, and ensure operational advantage over the adversaries.

The Army has taken foundational steps to improve its data posture with the emergence of the following, which have all informed the data plan:

- The Army Leader Dashboard
- The Army Enterprise Data Analytics Strategy for Business Systems
- Integrated Personnel and Pay System-Army (IPPS-A),
- ARCYBER's Big Data Platform (Gabriel Nimbus). Additionally, the Deputy Chief of Staff, G-3/5/7, published HQDA EXORD 009-20 Army Data Plan Implementation in Support

Lt. Gen. Bruce T. Crawford, the U.S. Army chief information officer, talked to senior leaders from all three components of the Army during the U.S. Army Reserve Chief Information Officer/Signal Workshop in the Office of the Chief of the Army Reserve on Fort Belvoir, Va. The workshop gave signal and cyber officers the opportunity to synchronize the Army Network Plan and discuss the way ahead. It also reinforced the importance of an efficient integrated network and its impact on readiness.
Photo by Sgt. Stephanie Ramirez

The Army Data Plan sets forth guiding principles to transform how we analyze and utilize data to enable data-driven decisions across its enterprise. Photo by Staff Sgt. Zane Craig

of Cloud Migrations on November 15, 2019.

The Army Data Board will govern data across the enterprise under the oversight of the Army's Chief Data Officer.

The Army will leverage key cloud capabilities to enable data use and sharing by leveraging advanced analytical technologies, like artificial intelligence and machine learning.

The data plan provides a comprehensive approach across people, processes, technology, and governance. This plan seeks to directly impact mission outcomes, provide decision-makers with timely and accurate information, and is critical to the Army's ability to fight and win wars in a multi-domain environment. The Army must enable decisive operational advantage by becoming a data-aware organization.

Winning with Data

CW5 Garth Hahn
Regimental CWO

Cloud, Big Data, Machine Learning (ML) and Artificial Intelligence (AI) are technologies changing the way the Army will operate in the future. Each technology builds on the other to ultimately enable the Army's leaders to make high quality decisions faster than its competitors. Data is the linchpin of this future. Cloud computing is a form of distributed computing that combines compute and storage resources that enable the analysis of large quantities of data. These data analytics enable computers to learn how to solve problems quickly and efficiently and gives rise to AI which is needed to identify the key information in the large volume of data collected on the modern battlefield.

The Army's future success in Multi-Domain Operations hinges on taking advantage of its large amount of data, but getting to this future requires action today. The Army is taking that action through the Army Data Plan and the Signal Corps' development of a workforce that can support the implementation of this technology.

The Army has a problem set surrounding the use of its data. Like most large organizations, it has systems and processes that create and store vast quantities of data

Courtesy graphic

that have duplication and formatting issues, are incomplete, or just not available to all the potential authorized users of that data. These problems can diminish the usefulness of what many regard as a high-value asset to the Army. Lt. Gen. Bruce Crawford, the US Army CIO/G-6, discussed an update to the Army Data Strategy while speaking at an AUSA conference in October. Originally published in 2016, the update to this strategy is designed to move the Army towards fixing its Data problem, and ultimately enabling leaders across the Army "to be able to orient, decide and act faster than peer adversaries."

The Army's G-3 published Execution Order (EXORD) 009-20 Army Data Plan Implementation in Support of Cloud Migration on 15 November 2019. The aim of this EXORD is to make the Army's data visible, accessible, understandable, trusted, interoperable, and secure (VAUTIS). This EXORD directs three
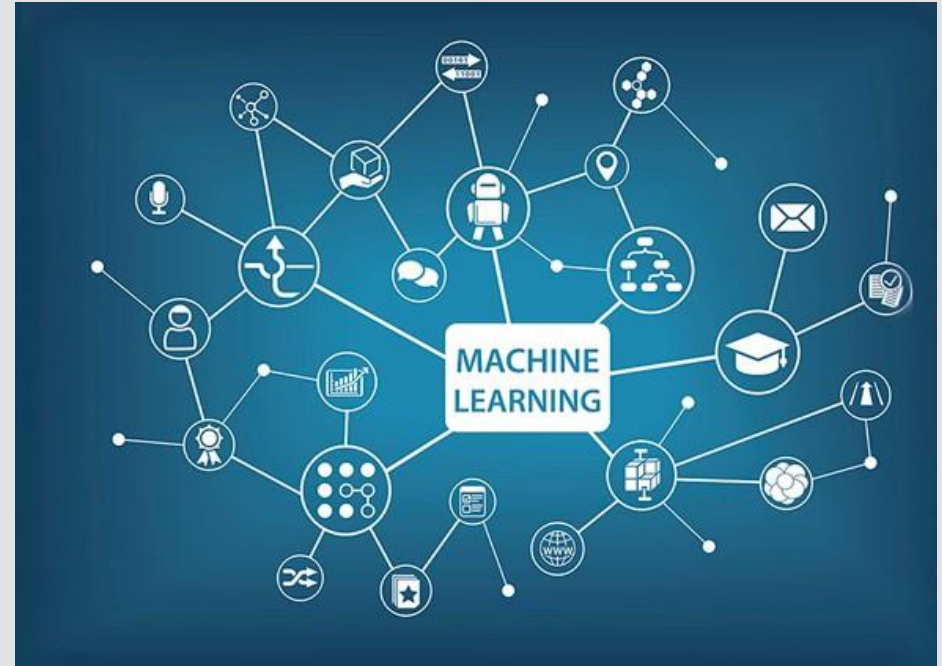
lines of effort (LOE); identify and create organic Army workforce talent in this area, establish governance and processes charged with aligning data-related activity with missions, and establish data and architecture standardization. The end state of this plan is an Army that uses its data effectively and securely to fight and win wars.

In coordination with the CIO/G-6, the US Army Signal School is preparing plans to support the building of a data focused workforce to enable the Army's Data Plans. The Signal Warrant Officer and the Functional Area (FA) Officer core competencies are being reviewed with the expectation these officers will be at the vanguard of solving the Army's data problem in the future. Creating a workforce that understands how Army data is used with Cloud and Big Data technologies can support Army operations from the Enterprise to the Tactical edge.

The Signal Corps' core competency is securely moving, storing and making data available to Army leaders across echelons through its current

Army Artificial Intelligence Task Force, which was created amid a recent push to increase AI efforts across the Defense Department, has recently started pilot projects to find ways to speed up security clearances and analyze imagery for military activity.
Army graphic

and evolving communication systems. Changing our training and force structure to build the data-talented workforce needed to enable Army operations is a natural progression for our Signal Soldiers.

The Army's senior leaders recognize the Army has a Data problem and have set forth a framework for solving that problem. The solution is bigger than any one branch and requires a concerted effort by every organization to participate and use their expertise to manage their data. The Army's Signal Corps is building the data-smart workforce to support the Army's success in Multi-Domain Operations.

New prototype unifies/simplifies network management ahead of coalition exercises

Maj. Nicholas Milano
Project Manager Tactical Network

As part of a rapid acquisition and development effort, the Army plans to put its unified network management prototype tool suite through its paces during several modernization events this year, including the Joint Warfighting Assessment 20 and Defender 20 multinational exercises in Europe this spring.

The new prototype software, known as Network Operations Management System, or NOMS, makes it easier for Soldiers from the tactical edge up through corps to plan, configure, monitor and manage their tactical network assets. These more capable, yet simplified and consolidated tools increase visibility across the entire network, automate tasks and reporting, and make it easier for communications officers (S6s and G6s) to manage the Army's extensive tactical network, ensuring Soldiers stay connected and well informed.

"What we plan to have in Defender 20 that we have not had in a very long time is a network of such large scale, which is multinational and mobile," said Col. Brian North, commander for the 11th Theater Tactical Signal Brigade

Project Manager (PM) Tactical Network engineers brief new prototype network management software enchantments to Cpt. Zac Depp, 10th Mountain Division network engineer at a network integration facility at Aberdeen Proving Ground, Maryland. The unit has been providing Soldier feedback to enhance the development of the software.
Photo by Justin Eimers

(TTSB), which will use the prototype during the exercises. "We will need a good network operations tool to manage that entire series of exercises -- from the jump to the crossings -- and all of tactical nodes and the strategic connectivity required to tie it all together."

North said that the current problem is that his Signal Soldiers have many different tools and laptops that each provide a piece of the network picture, such as bandwidth use, latency, and node status. These Soldiers have to look at all of the different stove-piped slices of information and try to quickly piece them together to identify any issues that may arise.

"I want to be proactive not reactive about giving commanders the best quality network possible," North said. "With these new tools, we are trying to fuse information together as much as possible to speed decision making. So we can take action to counter a problem, before a user is ever affected."

The new NOMS prototype is managed by the Army's Project Manager Tactical Network (PM TN), at the Program Executive Office for Command Control Communications-Tactical. This software provides overarching holistic network management capability across the breadth of the Army's network system portfolio. Through automation and virtualization, it converges network operations software and hardware, which currently requires 23 separate laptops, into one software application, consolidating all of the tools relating to network management (minus the cyber tools) into one place.

The new software toolkit will have also a common look, feel and functionality across all of the different network nodes, and unclassified, classified and coalition networks, making it easier for Soldiers to retain and build their network management expertise across systems.

Project Manager (PM) Tactical Network engineers brief new prototype network management software enchantments to Cpt. Zac Depp, 10th Mountain Division network engineer at a network integration facility at Aberdeen Proving Ground, Maryland. The unit has been providing Soldier feedback to enhance the development of the software.
Photo by Justin Eimers

"We've been trying to improve on getting our battalion and brigade headquarters to look at the network more holistically, at whether it's op-

erating in the way that it is intended, whether we are making the best use of the increasing narrow satellite resources that we have available, looking at where the threats are to the network," said Maj. Simon Watch, 11th TTSB Australian network operations exchange officer. "We are going to use the new tools to identify where we can improve the network, where we can optimize it, and aim to identify threats to the network sooner, so that we can make sure that the maneuver commanders have a stable and secure network where they can exercise command and control over their assigned forces."

To speed the NOMS acquisition process, PM TN leveraged its Unified Network Operations (UNO) middle-tier acquisition (MTA) authority to rapidly prototype proven commercial-off-the-shelf software to support existing operational needs, without needing formal requirements documentation. The goal of UNO is to provide simple, reliable, flexible and trustworthy network management tools for the both upper tactical internet (computer network) and lower tactical internet

(radio networks). PM TN is conducting several prototyping efforts under the UNO MTA that are serving as risk reduction events for capabilities that could potentially become Army programs of record to be fielded across the Army.

In support upper tactical internet NOMS prototype development, PM TN has been utilizing a successful developmental operations (DevOps) process, which puts developers alongside Soldiers in operational units to gain Soldier feedback that will be used to inform design improvements and future fielding decisions.

Maj. Nicholas Milano, assistant product manager for Tactical Cyber and Network Operations, (center left) discusses the network management prototype tool suite, with members of his team and Maj. Simon Watch, 11th Theater Tactical Signal Brigade Australian exchange network operations officer (center right), during a developmental operations Soldier touch point with the unit at Fort Hood, Texas.
Photo by Amy Walker

"We want to give Signal Soldiers the best tools to manage their network as quick as we can," said Lt. Col. Sung In, product manager for Tactical Cyber and Network Operations, at PM TN. "It is impossible to design a tool that is going to make everyone happy 100 percent of the time, but the DevOps process is enabling us to get an 80 percent solution into the hands of Soldiers, and we can continue to enhance that solution as we move forward."

As part of the DevOps process, the PM and industry have been conducting Solider touch point visits at multiple division, brigade and battalion S6 and G6 shops, including the 11th TTSB, 82nd Airborne Division and the 10th Mountain Division. These events provide a venue to collaborate on product design improvements. During the initial visit, the PM and vendor provide a demonstration, then the unit provides its preliminary feedback, both positive and nega-

tive, along with its capability "wish list."

This relationship does not end with the initial Soldier touch point, but continues throughout the development process. The PM has a flexible contract in place that allows it to keep enhancing the tool suite, making requested changes or adding features to meet Soldier need. Continuous Soldier feedback is immediately fed back into the software development sprint cycles, to be refined again as part of the next quarterly release cycle.

PM TN also integrated the NOMS prototype into its Emulation Test Bed, at Aberdeen Proving Ground, Maryland. The test bed simulates a live network with over 60 nodes and a network operations center, so the team can integrate, test and demonstrate new capability enhancements spurred from the constant Soldier feedback. Soldiers can come to the facility and evaluate the newest software iterations before they are provided back to the pilot units, enabling the engineers to tweak the evolving capability yet again.

The PM and the signal community are also exercising the NOMS prototype as part of several larger pilot programs being conducted to gain Soldier feedback to inform design, functionality and basis of issue decisions for other Army network modernization efforts. These include an on-going pilot being supported by the 1st Brigade Combat Team, 3rd Infantry Division to inform capability decisions on the eventual equipment refresh of the Army's legacy Tactical Network Transport (TNT) At-The-Halt systems. NOMS will also be integrated into TNT On-The-Move technical insertions that PM TN will deliver in this summer.

In preparation for JWA 20 and Defender 20 exercises, the PM, industry and supporting units are working hand-in-hand to ensure a strong foundation for success, including weekly synchronization meetings to iron out issues prior to deployment to Europe. During the actual exercises, PM and vendor engineers will be on site alongside the units, so if any problems or capability requests arise, they can provide solutions live on the fly, enabling Soldiers to evaluate them on site.

New prototype software, known as the Network Operations Management System, being developed by the Army's Project Manager Tactical Network makes it easier for Soldiers from the tactical edge up through corps to plan, configure, manage, monitor, control and secure/defend their tactical network assets.
Graphic by PM Tactical Network

"In the past, there has been a disconnect between the Army's written requirements, what the project manager fulfilled and what the operator really needs," North said. "Now, by having the PM and industry sitting there next to us in Defender, the PM is going to be able to walk out of the exercise, go back and make a 10-times better tool from that one opportunity to test run it, from seeing how Soldiers are going to break it, or use it in ways not intended, and then developing a product that meets Soldiers needs far better and faster than it was able to before."
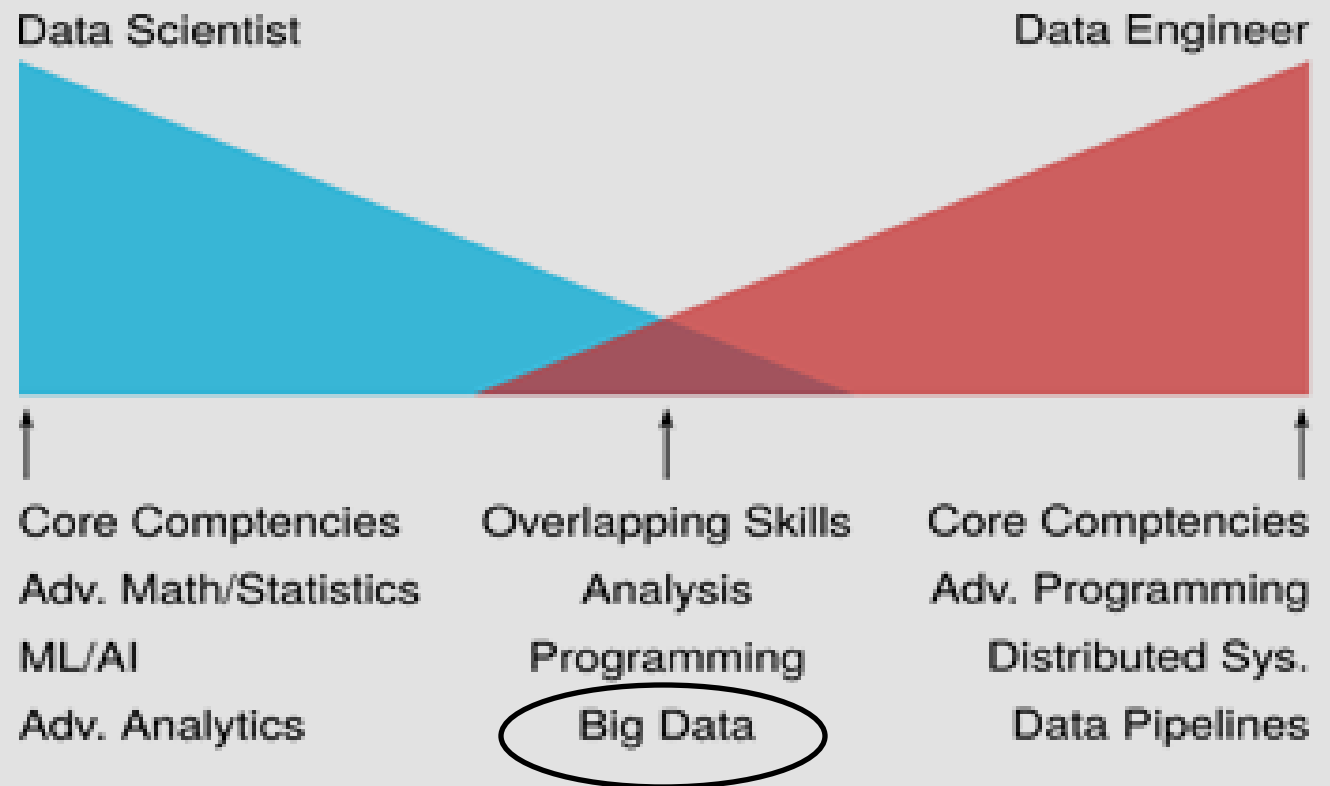
Understanding Data Management

Maj. Mustafa (Rey) Kamalreza
Office Chief of Signal

Data management is the process of acquiring, ingesting, validating, storing, organizing, protecting, and maintaining the data to ensure the accessibility, reliability and timeliness of the data to its users. Effective data management is a crucial piece of deploying the IT systems that run business applications and provide analytical information to help drive operational decision-making and strategic planning by corporate executives, business managers and other end users. It is also an essential element in the decision making and strategic planning of a successful organization. Today, organizations are making use of big data more than ever before to gain insights into trends and behavior. To make sense of the vast quantity of data gathered from different sources, enterprises turn to data management solutions and platforms to make processing, validation and functions simpler and less time consuming.

Databases are the most common platform used to hold data; database contain a collection of data so it can be accessed, updated and managed. Database administration is a core data management function. Once databases have been set up, performance monitoring and tuning must be done to maintain acceptable response times on database queries that users run to get information from the data stored in them.

A wide range of technologies, tools and techniques can be employed as part of the data management process. The most established type of database

Data Scientist		Data Engineer
Core Comptencies	Overlapping Skills	Core Comptencies
Adv. Math/Statistics	Analysis	Adv. Programming
ML/AI	Programming	Distributed Sys.
Adv. Analytics	Big Data	Data Pipelines

Courtesy Graphic

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BIG DATA INSTITUTE

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management system is the relational database management system. Relational databases are built around the SQL programming language. Other types of database management system technologies have emerged which are categorized as NoSQL databases that don't impose rigid requirements on database schemas; as a result, they can store unstructured and semi-structured data, such as sensor data, network, server, and application logs. NoSQL databases are often used in big data platforms because of their ability to store and manage various data types.

Data engineer and data scientist brings unique set of skills to perform big data initiatives. While there is a significant overlap when it comes to skills and responsibilities, the difference between data engineer and data scientist roles comes down to their focus and expertise. At the core, data engineers possess a programming background (Java, Scala or Python). In contrast, data scientists are usually from Math, Statistics, Economics, or Physics background. A data engineer deals with the raw and non-validated data, develops, constructs, tests and maintains architectures, such as databases and large-scale processing systems. A data scientist, on the other hand, is someone who cleans, massages, and organizes (big) data, create advanced analytics and create machine learning models and artificial intelligence. Data engineers employ a variety of languages and tools to acquire new data from diverse systems so that the system-specific codes, for example, can become information in further processing by data scientists.

Courtesy Graphic

The amount of data generated by the DoD and the Army networks will continue to grow at a significant rate as the number of nodes and sensors increases. Additionally, the Army Common Operating Environment (COE) concept calls for this data to no longer be processed through separate, stove-piped architectures, but a single, converged data system. Skills that an FA26 possesses are the perfect baseline knowledge of information systems and the data fabric to enable a workforce that the Army requires to establish big data platforms and architectures.
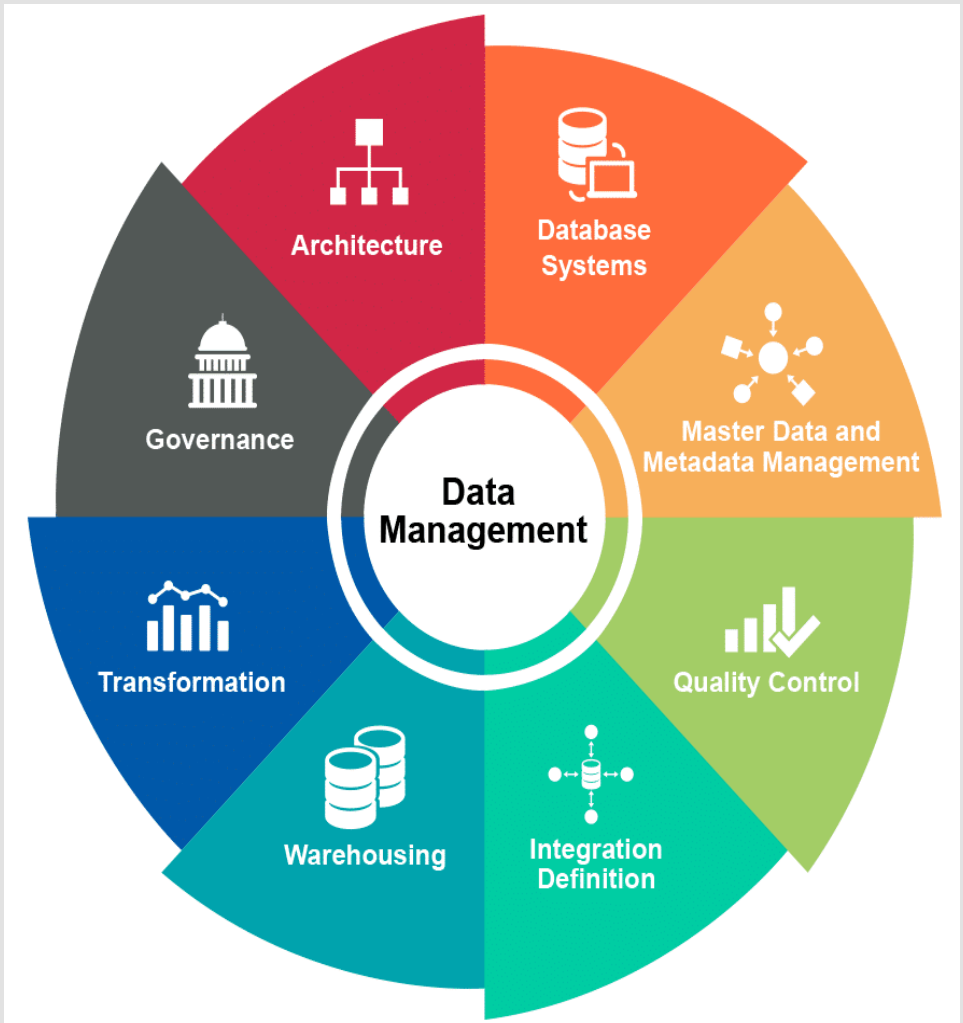
Enhanced Retransmissions

Maj. Kyle D. Barrett and Cpt. William S. (Wes) Shinego
2-2 Stryker Brigade Combat Team

When operating in the Decisive Action Training Environment (DATE), the Stryker Brigade Combat Team (SBCT) must be able to rapidly emplace FM retransmission (RTNS) teams, forward on the battle field, to support the Infantry and Cavalry with push-to-talk communications. SBCTs balance combined arms capabilities with significant mobility, however Stryker vehicles lack protection and are vulnerable to anti-tank weapons. Therefore, SBCTs primarily fight as a dismounted infantry formation, making push-to-talk communications extremely challenging. In total, the SBCT has 12 Stryker RTNS SNEs (Soldier Network Extensions) and two RTNS POPs (Points of Presence). Stryker RTNS SNEs are equipped with a feature called "CNR Gateway", which extends FM radio traffic beyond line of site
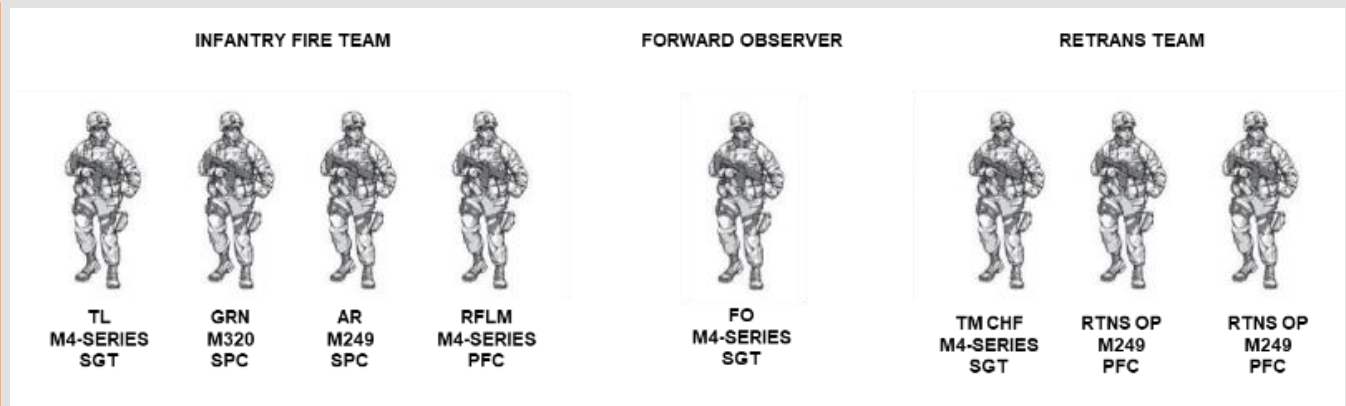
Enhanced RTNS Team Manning
Courtesy Graphic

(BLOS) to a battalion command post, using SATCOM NCW (Net Centric Waveform). Unfortunately, Stryker RTNS vehicles, in most cases, are unable to deploy far enough forward to support dismounted infantry, due, again, to the Stryker vehicle's lack of protection from enemy direct and indirect fire. To overcome this, 2d Stryker Brigade Combat Team, 2d Infantry Division (2-2 SBCT) developed three Enhanced RETRANS Teams (E-RTNS). These E-RTNS teams were formed around the three brigade RTNS teams assigned to the Brigade Signal Company.

The E-RTNS team model 2-2 SBCT developed, had several objectives: the teams needed to be able to emplace by helicopter, have dedicated security, have anti-tank capabilities, and include a trained artillery observer. Each of the three teams were partnered with the three SBCT infantry battalions, who were each tasked to provide an Infantry Fire Team and Forward Observer. The three E-RTNS teams they created consists of: one 25U20, two 25U10s, one 11B20, two 11B10s, and one 13F20. They regimentally aligned each of the BDE RTNS teams with each of the infantry battalions in order to develop an ongoing and working relationship. Each team regularly exercised specific battle drills and conducted rehearsals including base defense, assembly of area operations, helicopter cold load training, etc.

During the planning process, and as the brigade planning team determined

the need for the capability, the BDE S6 tasked specific infantry battalions with E-RTNS support. The BDE S6 determined which infantry battalion to task based on where the team was needed, in time and space, across the brigade's area of operation. The tasked battalion assumed a TA-CON (Tactical Control) command relationship with their regimentally aligned RTNS team.

They needed to make the E-RTNS teams lightweight, expeditionary, and capable of loading and unloading a helicopter rapidly. In order to effectively extend FM communications at great distances, lightweight power generation was a priority early on, in the design process. The most lightweight generator on the SBCT MTOE (modified table of organization and equipment) is the MEP-831A 3 kilowatt generator, which weighs 334 lbs. (with fuel), which is too heavy for the E-RTNS application. After extensive research, they purchased the Honda EU2200i generator, which weighs 55 lbs. (with fuel). The generator can run for approximately 12 hours on a single gallon of gasoline while powering the full E-RTNS equipment set.

The brigade selected the PTS® SINCGARS radio mount, which is a popular, COTS (commercial off the shelf) solution, eliminates the need for an external power supply, and has all the capabilities of the standard AN/VRC-92 dual-long-range SINCGARS radio mount. Each E-RTNS team was equipped with three PTS® mounts, giving them the capability to extend three FM nets. In order to use PTS® mounts for RTNS, the Signal Company ordered 15 foot RTNS cables.

In order to provide an alternate, beyond-line-of-site communication capability, the brigade signal company engineered a Pelican Case mounted BFT2/JCR. This proved to be a tremendous capability, as it allowed the BDE HQ to communicate with the E-RTNS team, without tying up a brigade FM net. The Pelican Case BFT2/JCR system was repurposed from an AN/UYK-128 vehicle kit, modified, and made to fit.

Throughout their NTC rotation, 19-10, they employed E-RTNS during the early hours of training day one (TD1). As the Lancer Brigade was set in its initial attack position, 8-1 CAV planned to insert three OPs (observation points) in order to conduct reconnaissance of several NAIs (named areas of interest) situated several kilometers forward of the infantry FLOT (forward line of troops). The Brigade

Enhanced RTNS Equipment Set
Courtesy Graphic

2 Kw Generator 91 Octane Gasoline JCR Box Kit

2 x OE-254 Antenna 2 x OE-254 Antenna 2 x OE-254 Antenna

PTS 1523 ASIP Radio Mount PTS 1523 ASIP Radio Mount PTS 1523 ASIP Radio Mount

S6's line-of-sight analysis determined that they would be able to communicate with two OPs using standard Stryker mounted RTNS platforms, but the third was too far forward and would leave a Stryker RTNS vulnerable to enemy fire. The furthest northeast OP was situated within 4-23 INs axis of advance, and required an E-RTNS capability, until 4-23IN would be able to emplace Stryker mounted RTNS later in the operation.

At approximately noon the day before TD1, the E-RTNS assumed PZ posture at Bicycle Lake. By 6 PM, the E-RTNS team was inserted on a mountain complex known as The Whale. The E-RTNS helicopter insertion was done simultaneously with 8-1CAVs OP insertions. Though the E-RTNS team was inserted roughly 1,000 meters from their planned location, they were able to transport their equipment to the planned location and were established in approximately two hours.

The fire team and forward observer provided security for the radio operators as they established the three FM RTNS and BFT2/JCR, and then established a parameter, including hasty fighting positions and observation posts. In order to test the functionality of The RTNS, the team leader established communications with the 8-1CAV OP and the 2-2SBCT Main CP by conducting a call from a man-pack radio set to low power, over the brigade O&I (Operations and Intelligence) net.

The E-RTNS facilitated clear FM communication from the 8-1CAV OP, allowing timely reporting of enemy activity throughout that phase of the operation. Once 4-23 IN moved forward and were able to emplace their Stryker RTNS, the E-RTNS displaced via helicopter back to the brigade main command post to re-fit and prepare for follow on operations. Within a few hours, the Fire Team and Forward Observer returned to 4-23IN, and the signal company

E-RTNS located at The Whale extending FM more than 25km.
Courtesy Graphic

RTNS team deployed to a follow-on RTNS location. Another E-RTNS team was employed later in support of a 1-17IN Air Assault Operation, and achieved similar success.

As long as Stryker Brigade Combat Teams across the Army continue to maintain legacy radios like the RT-1523 SINCGARS, there will always be a need to rapidly move RTNS capabilities close to the infantry FLOT. The E-RTNS model works well for an SBCT because it does not require a lot of additional new equipment and teams are formed using traditional command relationships. The E-RTNS model enhances a standard RTNS site into an ISR asset, an observation post able to prosecute both planned and unplanned artillery targets, and a fighting position with anti-tank capability. Considering the speed and nature at which an SBCT maneuvers and fights, the E-RTNS generates options for commanders, especially when he or she is fighting a hybrid enemy in complex terrain.

E-RTNS site during TD1. Antennas were placed on the ground as a means to mask their location from enemy visual contact.
Courtesy photo

Army scientist receives honors for signal processing research

CCDC Army Research Laboratory Public Affairs

An Army scientist earned top honors for his signal processing research from IEEE, the world's largest technical professional organization dedicated to advancing technology for the benefit of humanity.

Dr. Hamid Krim, a program manager in information processing and fusion at Army Research Office, and co-author Dr. Mats Viberg, vice-chancellor from the Bleking Institute of Technology in Karlskrona, Sweden, will receive the 2020 IEEE Signal Processing Society Sustained Impact Paper Award at the International Conference on Acoustics, Speech and Signal Processing this May in Barcelona, Spain.

The paper, "Two Decades of Array Signal Processing Research: The Parametric Approach," (was published in IEEE Signal Processing Magazine in July 1996. At the time, Krim

worked at Massachusetts Institute of Technology and the research was conducted through the Center of Imaging Sciences, a multi-university center funded by ARO. The center then included Washington University, Brown University, Harvard University and MIT. The research paper provides a critical review of the accomplishments of signal processing in high-dimensional statistical analysis of multi-channel data, and also looks to the future in the areas of multi-antenna and array data processing.

"While the signal processing research area has always been important in radar, sonar and other defense applications, it has further increased with the advent and huge success of wireless communication, the dramatic rise of the social tetherless devices and the information world we live in," Krim said. "That has kept the topic current and of continued interest."

The Sustained Impact Paper Award honors authors of a journal article of broad interest that has had sustained impact over many years. In this case, the almost 23-year-old article has averaged nearly 190 citations per year.

At ARO, an element of the U.S. Army Combat Capabilities Development Command's Army Research Laboratory, Krim leads efforts to fund disruptive research focusing on bio-inspired and multi-task machine learning and artificial intelligence that are applicable to the Army's top priorities. His research interests lie in the broad area of data science with a focus on statistical signal analysis and machine learning.

He is also pursuing applications in nuclear non-proliferation agreement enforcement, visual cortex modeling and image classification.

The IEEE Signal Processing Society selected an Army scientist to receive its 2020 Sustained Impact Paper Award.
Courtesy photo

19

The Signal Corps Command Post Fleet during World War II
Operations and Combat at Leyte, Oct. 1944

Steven J. Rauch
US Army Signal Corps Branch Historian

When most people think of WWII Pacific Theater of Operations, they usually associate the epic battles and campaigns with the Sailors and Marines of the Naval service. In fact, the US Army deployed three field armies, six corps and 21 divisions, over 688,000 men in ground forces alone, compared to the six divisions of 160,000 men contributed by the Marine Corps. That manpower enabled the Army to conduct multiple, often simultaneous, large scale combat operations (LSCO) across thousands of miles. One LSCO occurred in October of 1944 when the US Sixth Army, comprised of 202,500 ground troops, invaded the Philippine island of Leyte. The operation lasted until the end of December and resulted in 15,000 US Army casualties compared to 49,000 suffered by the Japanese Army.

Seizing Leyte was the goal of the Southwest Pacific Area (SWPA) Theater commander to return US presence to the Philippines. Gen. Douglas MacArthur led a force of Army, Navy, and Army Airforce components, along with allied units, in a multi-domain operation (MDO) whereby action on the ground, on the sea, and in the air had to be synchronized to achieve success. To enable Army commanders from theater to battalion to communicate in an MDO environment the SWPA chief Signal officer, Maj. Gen. Spencer B. Akin, and his staff employed creative and innovative methods to link the domains. One innovation was floating command posts (CPs) which used both Army and Navy ships as platforms for communications technology so commanders could communicate with units fighting to get ashore. For the CPs, the Signal Corps ac-

Sixth Army Landings on Leyte, Oct. 17-20, 1944 from Reports of General MacArthur Vol I, CMH Pub-13-3 US Army Center of Military History, 1994 ed.

quired five suitable vessels which were successfully employed during the first critical days of the Leyte invasion.

In early October, Task Unit 78.1.12 (Army HQ Craft) rendezvoused with over 470 other vessels ranging from patrol boats to battleships at Hollandia, 1240 miles from the beaches at Leyte. There, Akin organized Signal capability for the operation. He stationed himself aboard *Patrol Craft Escort (PCE) 848* along with a small staff to handle Gen. MacArthur's personal messages, a special VHF team to operate eventual land links, and a team to intercept Filipino guerrilla and Japanese broadcasts. The other SWPA HQ craft – *PCE 849* – carried the Assistant Theater CSO, Lieut. Col. Benjamin H. Pochyla and staff plus an intercept team of Filipino Scouts and US Army code clerks. The remaining CP ship, *PCE 850,* carried Sixth Army Signal staff officers. In addition, two former commercial vessels served as platforms for support of news media personnel. The broadcast vessel *Apache* had been augmented with additional public rela-

tions officers and enlisted men to operate the recording equipment installed on the ship. The other vessel, *FP 47,* carried four public relations officers and two war correspondents.
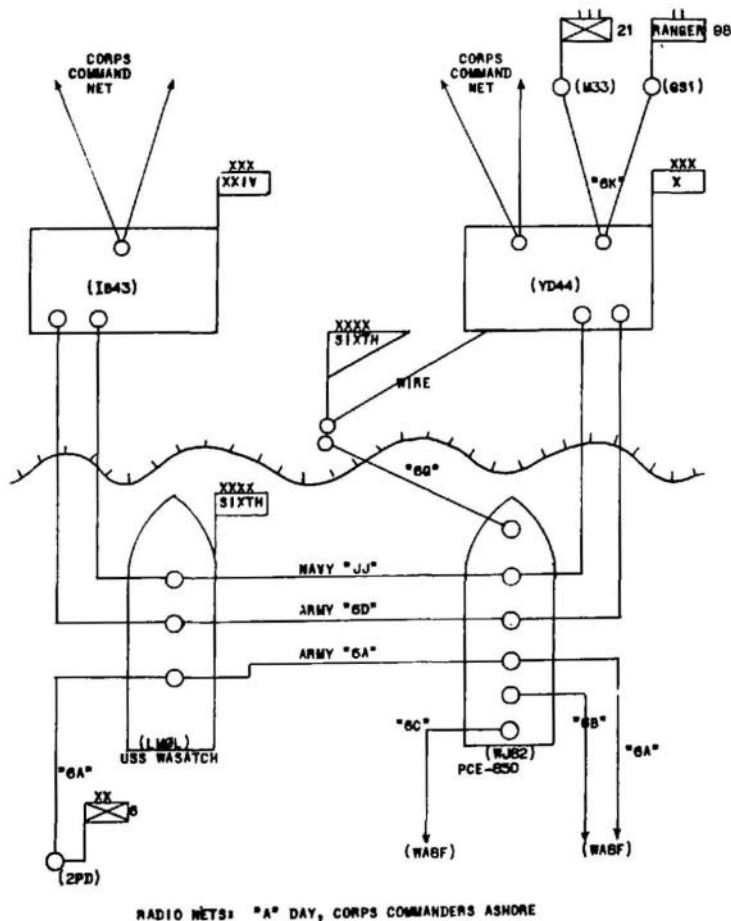
The means to the link the SWPA elements afloat and the elements assaulting the beach was a converted 1½ ton truck equipped as a VHF radio relay terminal with associated Signal men

PCE 848
From Maj. Gen. Benjamin H. Pochyla Collection, Signal History Office

loaded on a landing craft to be on the beach as soon as practicable. Sixth Army was equipped with a complete command post configured in seven large vans with their personnel loaded on landing ships. Thus the theater and Army level Signal staffs had prepared their commands with high-capacity, mobile communications equipment that could operate on sea and land to enable communica-

RADIO NETS: "A" DAY, CORPS COMMANDERS ASHORE

Sixth Army ship to shore communications network with PCE 850 and links to XXIV Corps and X Corps during landing at Leyte, Oct. 20, 1944.
From Annex 4, Report of the Signal Officer, Sixth Army Report of the Leyte Operation, 1945

chored off Palo, designated as Red Beach. Radio silence was observed from H-hour to H+1. The Signalmen on the ships were poised at their keys and at H+1 each vessel began establishing radio contacts in their respective nets. The *FP 47* and *Apache* promptly broadcast to the world, "In a major amphibious operation we have seized the eastern shore of Leyte Island in the Philippines." Messages flew between the three PCEs. At H+4 the VHF truck was unloaded into the surf and drove onto the beach amid mortar fire that wounded some Signalmen. Within 15-30 minutes the VHF was in operation and communicating with the CP fleet. Shortly thereafter, at H+5 a historic event occurred when a figure in a gold braided cap waded onto Red Beach, walked over to the dripping wet VHF truck, took a microphone into his hand and said, "I have returned. By the grace of Almighty God our forces stand again on Philippine soil." On the *Apache*, MacArthur's speech was relayed to Australia and from there to the world.

During the operation, *PCE 848* handled over 10,000 words per day. *PCE 849* served primarily as a monitor ship and a standby in case of trouble on the *848* and to handle overflow traffic. Meanwhile, *PCE 850s* powerful equipment operated within Sixth Army nets, particularly the command net, as a relay for Army, corps, and other units who could not communicate directly with each other and handled over 25,000 words in a single day (see network diagram to left). By Day (D)+2, ship-to-shore communications were fully operational and transmitted teletype and voice communications directly from the beachhead to any base in the theater. The CP fleet, with the help of the VHF radio relay equipment, had surpassed all expectations to provide communication to commanders from Army down to battalion on both sea and land.

tions in a contested peer-on-peer operational environment.

At about 8 a.m. on Oct. 20, 1944, the CP fleet navigated through the maze of ships crowded into Leyte Gulf and an-

Though the technical challenges of communications had been overcome, there was still an enemy threat as the Japanese still possessed the capability to contest the invasion in the land, sea, and air domains. When the Japanese fleet began their counter-attack on Oct. 23, they lured the US Third Fleet away

from Leyte Gulf. When the Third Fleet went after the Japanese fleet, they abandoned the troop-ships, transports and other non-combat ships and exposed them to air attacks.

The Japanese air attacks be-gan Oct. 24 with an estimated 150-200 planes, mostly twin-engine bombers. At just past 8:30 a.m., the *PCE 849* shot at an attacking Japanese bomber and claimed a probable destruction of the plane. The next day saw several waves of enemy bombers, who according to the commander of *PCE 849*, "were com-ing at us from all sides." Of the Signal Corps men that crewed the .50 caliber guns on the *849*, one naval officer said, "They are absolutely unflinching. I have seen them staying at their posts without showing a sign of fear when Jap planes were coming right at their guns." By the time the Leyte op-eration had ended, the *PCE 849* had experienced 70 air raids and shot down three Japanese planes.

During the raid of Oct. 25, *PCE 850* was anchored about 800 yards off Red Beach. The ship's commander stated, "I was atop . . . watching one of the Jap-anese bombers as it went down off our stern. Suddenly shells from other ships started flying through our rigging. I didn't real-ize they were firing at a plane that was over us. I had heard no bomb hit, but we were struck on the starboard side by a missile from a heavy Jap bomber."

The crew of *PCE 850* poured fire into the attacker and de-stroyed the bomber but the ship was a scene of destruction. The bomb had gone through the su-perstructure, into the ward room, the captain's cabin and the com-bat information center. Two men
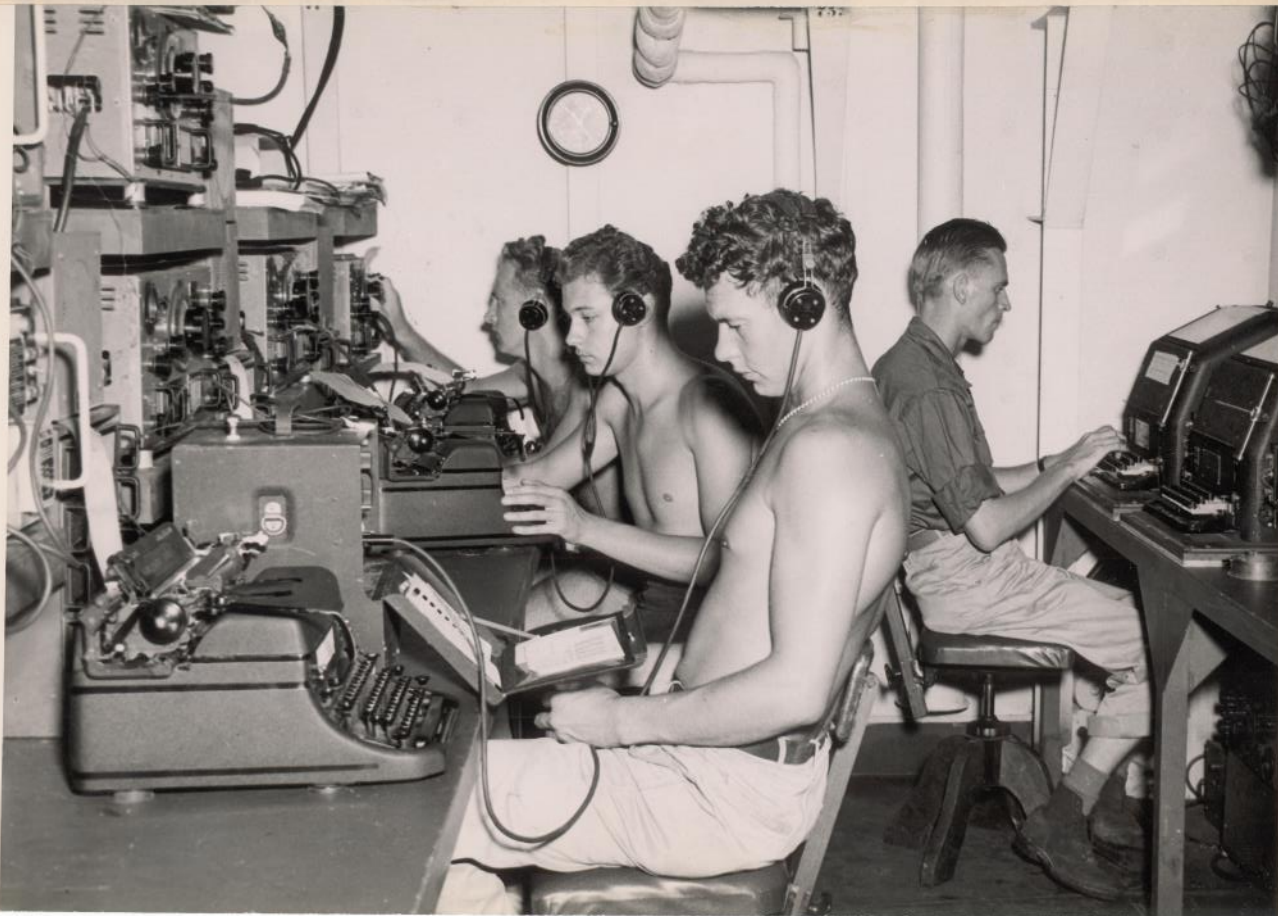
PCE 849 Receiver Room
From Maj. Gen. Benjamin H. Pochyla Collection, Signal History Office.

were killed and 10 wounded. The Army Signal men suffered no casualties but they helped render medical aid to the wounded. More combat came at 1300 hours when Japanese planes attacked again. This time the *850*'s gunners were out for revenge. One of the attackers was destroyed by the ships' 3-inch gun which blew it apart.

The most deadly incident occurred during a raid on Oct. 28. The *PCE 848* was anchored about 2,000 yards off the Tacloban air strip. The next thing the ship's watch knew, the air was filled with the shrill scream of falling bombs. Men were rushing to their battle stations as a stick of 500 pound bombs struck the ship. Shrapnel riddled the hull and superstructure punching 80 holes into the starboard side and 20 on the port side. One piece of shrapnel pierced the code room, a chair, the code room desk and typewriter, then burst into General Akin's quarters, occupied at the time by Akin. The ship's captain was asleep in his quarters, which was riddled with shrapnel going in one side and out the other. He barely survived the projectiles and fire that resulted from the impact.

Casualties on *PCE 848* were heavy. Six men were killed and 23 wounded. One of the dead was a Signal corps code clerk. Two other Signalmen were wounded, a master sergeant radio technician and technician fifth grade code clerk. However, by 9 a.m., all casualties had been cared for, all wreckage cleared away, the ward room and mess hall cleaned up, and breakfast was being served as though nothing had happened.

The success of the Signal corps CP fleet at Leyte continued during following operations, such as the invasion of Luzon in January 1945. Once again the Signal Corps CP fleet was relied upon to play a major role and in fact, additional ships were added to expand and extend communications capability from the sea to the foxhole. The service of the CP fleet culminated in Tokyo Bay on Sept. 2, 1945 where several of the ships stood witness to the formal surrender ceremonies that ended WWII.

Captain of PCE 848 holding shrapnel from Oct. 28, 1944 air attack.
From Maj. Gen. Benjamin H. Pochyla Collection, Signal History Office

In the next

ARMY COMMUNICATOR

Expeditionary Signal Battalions